

CLAIMS

What is claimed is:

1. A fiber optic tube cable having improved thermal stability and comprising an air blown fiber (ABF) tube within which one or more air blown optical fiber units can be installed, said air blown fiber (ABF) tube formed from a cross-linked polyolefin having a first coefficient of thermal expansion and comprising at least one filler material having a second coefficient of thermal expansion less than said first coefficient of thermal expansion; whereby said tube has a coefficient of thermal expansion less than said first coefficient of thermal expansion of said cross-linked polyolefin.
2. The tube according to claim 1 wherein said at least one filler material comprises a predetermined amount of an inorganic filler material selected from, but not limited to, the group comprising chopped glass fiber, glass spheres, mica, talc and  $\text{CaCO}_3$  and mixtures thereof.
3. The tube according to claim 1 wherein said at least one filler material comprises a predetermined amount of a polymeric filler material, and wherein said filler material may be fibrous or spherical but is not limited to these morphologies.
4. The tube according to claim 1 wherein said cross-linked polyolefin comprises cross-linked high density polyethylene.
5. The tube according to claim 4 wherein the cross-linked density range is between 40% and 90% according to ASTM Standard D 2765-95, Method A.

6. The tube according to claim 2 wherein the chopped glass fiber content of said tube is not greater than 5.0% by mass.

7. The tube according to claim 6 wherein the chopped glass fiber consists of E-glass with a nominal diameter of 14  $\mu\text{m}$  and a typical length less than 20 mm.

8. The tube according to claim 1 comprising a smooth outer layer of polyolefin or cross-linked polyolefin.

9. The tube according to claim 1 comprising an inner layer of polyolefin or cross-linked polyolefin within said tube comprising a predetermined amount of silicone lubricant to facilitate installation of the one or more air blown optical fiber units.

10. The tube according to claim 9 wherein the inner layer of said tube further comprises a predetermined amount of chopped glass fiber.

11. The tube according to claim 1 wherein said tube has a coefficient of thermal expansion value of less than 150  $\mu\text{m}/\text{m}^\circ\text{C}$  over the temperature range of 20°C to -40°C.

12. The tube cable according to claim 1 wherein a plurality of said air blown fiber (ABF) tubes are provided with a cross-linked high density polyethylene jacket thereover comprising a predetermined amount of carbon black or other suitable ultraviolet (UV) radiation stabilizer.

13. The tube cable according to claim 12 wherein said jacket further comprises a predetermined amount of chopped glass content that is not greater than 5.0% by mass of said jacket.

14. The tube cable according to claim 12 comprising one or more dielectric or metallic strength elements in addition to said plurality of air blown fiber (ABF) tubes.

5 15. A fiber optic tube cable assembly having improved thermal stability and comprising:

10 (a) a plurality of air blown fiber (ABF) tubes within each of which one or more air blown optical fiber units can be installed, said air blown fiber (ABF) tubes formed from a cross-linked polyolefin having a predetermined coefficient of thermal expansion and comprising at least one filler material having a coefficient of thermal expansion less than said predetermined coefficient of thermal expansion of said cross-linked polyolefin; and

15 (b) a jacket positioned around said plurality of air blown fiber (ABF) tubes, said jacket being formed from cross-linked polyolefin having a predetermined coefficient of thermal expansion and comprising at least one filler material having a coefficient of thermal expansion less than said predetermined coefficient of thermal expansion of said cross-linked polyolefin of said jacket;

20 whereby said tubes and said jacket have a coefficient of thermal expansion less than said predetermined coefficient of thermal expansion of said cross-linked polyolefin of said tubes and said jacket.

16. The tube cable assembly according to claim 15 wherein said at least one filler material of said tubes and said jacket comprises a predetermined amount of an inorganic filler material selected from, but not

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limited to, the group comprising chopped glass fiber, glass spheres, mica, talc,  $\text{CaCO}_3$  and mixtures thereof.

17. The tube according to claim 15 wherein said at least one filler material comprises a predetermined amount of a polymeric filler material, and  
5 wherein said filler material may be fibrous or spherical but is not limited to these morphologies.

18. The tube cable assembly according to claim 15 wherein said cross-linked polyolefin comprises cross-linked high density polyethylene.

19. The tube cable assembly according to claim 18 wherein the  
10 cross-linked density range is between 40% and 90% according to ASTM standard D 2765-95, Method A.

20. The tube cable assembly according to claim 16 wherein the chopped glass fiber content of said tubes is not greater than 5.0% by mass of said tubes.

21. The tube cable assembly according to claim 20 wherein the  
15 chopped glass fiber consists of E-glass with a nominal diameter of 14  $\mu\text{m}$  and a typical length less than 20 mm.

22. The tube cable assembly according to claim 15 comprising a smooth outer layer of cross-linked high density polyethylene around each of  
20 said tubes.

23. The tube cable assembly according to claim 15 comprising an inner layer of polyolefin or cross-linked polyolefin within each of said tubes comprising a predetermined amount of silicone lubricant to facilitate installation of the one or more air blown optical fiber sub-units.

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24. The tube cable assembly according to claim 23 wherein the inner layers of said tubes further comprise a predetermined amount of chopped glass fiber.

5 25. The tube cable assembly according to claim 15 wherein said tubes and said jacket have a coefficient of thermal expansion value of less than 150  $\mu\text{m}/\text{m}^\circ\text{C}$  over the temperature range of  $20^\circ\text{C}$  to  $-40^\circ\text{C}$ .

26. The tube cable assembly according to claim 16 wherein said jacket comprises a chopped glass content that is not greater than 5.0% by mass of said jacket.

10 27. The tube cable assembly according to claim 15 comprising one or more dielectric or metallic strength elements in addition to said plurality of air blown fiber (ABF) tubes.

28. A fiber optic tube cable assembly having improved thermal stability and comprising:

15 (a) a plurality of air blown fiber (ABF) tubes within each of which one or more air blown optical fiber units can be installed, said air blown fiber (ABF) tubes formed from a cross-linked high density polyethylene comprising a predetermined amount of carbon black and a predetermined amount of chopped glass fiber, and  
20 each of said air blown fiber (ABF) tubes including a smooth outer layer of cross-linked high density polyethylene thereover and an inner layer of cross-linked high density polyethylene comprising a predetermined amount of silicone lubricant therein; and

5            29.     The tube cable assembly according to claim 28 wherein the  
cross-linked density range is between 40% and 90% according to ASTM  
Standard D 2765-95, Method A.

31. The tube cable assembly according to claim 30 wherein the chopped glass fiber consists of E-glass with a nominal diameter of 14  $\mu\text{m}$  and a typical length less than 20 mm.

33. The tube cable assembly according to claim 28 wherein said tubes and said jacket have a coefficient of thermal expansion value of less than  $150 \mu\text{m}/\text{m}^{\circ}\text{C}$  over the temperature range of  $20^{\circ}\text{C}$  to  $-40^{\circ}\text{C}$ .

20            34.     The tube cable assembly according to claim 28 wherein the  
predetermined chopped glass content of said jacket is not greater than 5.0%  
by mass of said jacket.

35. The tube cable assembly according to claim 28 comprising one or more dielectric or metallic strength elements in addition to said plurality of air blown fiber (ABF) tubes.

36. The tube cable assembly according to claim 28 comprising a  
5 water-blocking means applied around said air blown fiber (ABF) tubes.

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